EPA’s Health Impacts and Emissions Quantification Tools

Session D1 - Breathe EEasy: Health and Energy Efficiency

Cassandra Kubes
U.S. Environmental Protection Agency
State and Local Energy and Environment Program

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EPA’s State and Local Energy and Environment Program

State and Local Energy and Environment Program

- Helps state and local governments reduce emissions to meet their environmental, energy, and economic goals
Energy choices matter for air quality and public health

Clean Energy

Energy Efficiency, Renewable Energy, Low Emission Fuels

- Reduce total electricity demand
- Reduce demand for transportation-related fossil fuels
- Displace (or replace) fossil fuel electricity sources with clean distributed generation or renewable energy (RE)
- Displace (or replace) fossil fuel transportation with RE or low emission sources

Reduce Emissions

- Reduce air pollution and improves air quality (AQ)
- Reduce GHGs and climate impacts

Deliver Health and Other Societal Benefits

- People avoid premature death and costly illnesses
- Children miss fewer school days
- Businesses benefit from increased worker productivity, fewer employee absences
Emissions, air quality, and health benefits are a key component of EPA’s multiple benefits framework.
EPA offers a suite of tools for quantifying emissions, AQ, and health impacts of clean energy

- Energy efficiency (EE) or renewable energy (RE)
- Programs, policies, or projects
- Estimates changes in electricity generation
- Estimates changes in emissions of CO$_2$, NO$_x$, SO$_2$, and primary PM$_{2.5}$
- Estimates air quality changes (primary and secondary PM$_{2.5}$)
- Estimates dollar value of public health benefits
- Regional factors for estimating the monetized health benefits of kWh saved through EE or generated through RE
EPA’s AVoided Emissions and geneRation Tool (AVERT)

- Translates EE/RE programs to avoided NO\textsubscript{x}, SO\textsubscript{2}, PM\textsubscript{2.5}, and CO\textsubscript{2} emissions impact
- User friendly, transparent, and credible
- Steps:
  - Locate your AVERT region
  - Obtain energy saved (MWh) for EE programs (portfolio or uniform), or the capacity of wind/solar installation (MW)
  - Chose from multiple scenario options built into the tool
  - Run the model
  - View results in graphical and savable formats
Why Use AVERT?

- SIP credit in a state’s National Ambient Air Quality Standard (NAAQS) Clean Air Act Plan
- Compare emission impacts of varying levels of EE/RE programs, projects, and policies
- Understand emissions impacts for cost-effectiveness tests
- Calculate emission reductions in your state or county in AVERT’s web-based edition
- Use AVERT-generated emission factors to estimate magnitude of emission reductions without running the tool
- This is not a long-term projection tool
  - To conduct analysis more than 5 years from the baseline, users must use AVERT’s statistical module and future year scenarios
- Publications that cite AVERT - https://www.epa.gov/statelocalenergy/publications-cite-avert
COBRA is a free, easy-to-use, peer reviewed screening model that quickly:

- Estimates county-level health impacts from user-entered changes in criteria air pollutants from any source in the National Emissions Inventory
- Monetizes the economic value of those benefits
- Presents results via tables and maps that facilitate visualization of the results

Health Effects include:

- Adult Mortality
- Infant Mortality
- Non-fatal Heart Attacks
- Respiratory and Cardiovascular Hospital Admissions
- Acute Bronchitis
- Upper and Lower Respiratory Symptoms
- Asthma Exacerbations, Emergency Room visits
- Minor Restricted Activity Days
- Work Loss Days
COBRA Screening Model: User Steps

**USER INPUTS** = Change in 2017 or 2025 Emissions
- PM2.5, SO2, NOx, NH3, VOCs

**Quantifies Changes in Air Quality**
(Specifically, particulate matter (PM))

**Calculates Change in Health Outcomes**
(Resulting from PM changes)

**Calculates Monetary Value of Health Outcomes**

**OUTPUTS =** Tables and maps of illness cases and deaths avoided as well as the related economic value
Why Use COBRA?

- Analysts, planners, and officials from environmental, health, energy, transportation, and economic development agencies can use COBRA to:
  - Quickly and inexpensively compare different clean energy policies and identify those that:
    - Are likely to result in the greatest health benefits
    - Are expected to reduce health risks in the most cost-effective manner
  - Estimate and promote improvements in air quality and economic value of associated human health benefits of:
    - Clean and/or renewable energy projects
    - Other types of projects, such as transportation or municipal waste
  - Convey how clean energy benefits can go beyond a single county and impact people at the state, regional, and national levels
- Publications that cite COBRA -
  https://www.epa.gov/statelocalenergy/publications-cite-cobra
EPA’s health benefits per kilowatt-hour (BPK) values

- Use to quickly estimate the monetary value of health benefits from reductions in fine particulate matter (PM$_{2.5}$) due to EE/RE
- Helps to indicate direction and relative magnitude when comparing across state and local EE/RE policies
- Free, Easy to use, Peer-reviewed
- BPK values (¢/kWh) are available for:
  - Wind, solar, portfolio EE, and uniform EE programs
  - 10 regions of the United States
  - Solar, wind, uniform and peak EE
- Technical report provides details on EPA’s methodology and appropriate uses for the values
How to use BPK values

1. Select appropriate BPK value
   - Region, technology, sensitivity, discount rate (3% or 7%)

2. Multiply BPK value by
   - kWh saved from EE
   - kWh generated by RE

Example analyses:
   - Estimating the public health benefits of regional, state, or local-level investments in EE/RE
   - Understanding the cost-effectiveness of regional, state, or local-level EE/RE projects, programs, and measures
   - Incorporating health benefits in short-term regional, state, or local policy analyses and decision-making

\[ BPK \times \Delta kWh = \text{Estimated Health Benefits (\$)} \]
BPK values vary more by region than technology, reflecting existing fuel mix and population.
<table>
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<th>Region</th>
<th>Project Type</th>
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<th>2017 $/kWh (low estimate)</th>
<th>2017 $/kWh (high estimate)</th>
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Closing Questions

- Do you have examples where quantifying health benefits would be useful in your work?
- Would these tools be helpful for your efforts?
- What other resources on quantifying emissions and health impacts would be helpful?
Resources

**GHG Inventory Tools**
Provides frameworks and default data for comprehensive GHG inventories of state, local, and tribal government activities
https://www.epa.gov/statelocalenergy/state-local-and-tribal-inventory-tools

**Greenhouse Gas Equivalencies Calculator**
Translates GHG reduction numbers into easily understood terms (e.g. gallons of gasoline, etc.)
https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

**Tool Finder for Local Government Clean Energy Initiatives**
Screens the tools/resources that measure the emissions, energy, and economic impacts of clean energy policies and programs
https://www.epa.gov/statelocalenergy/tool-finder-local-government-clean-energy-initiatives
AVoided Emissions and geneRation Tool (AVERT)
Estimates the emissions benefits of clean energy polices and programs

CO-Benefits Risk Assessment (COBRA)
Estimates the economic value of the air quality-related health benefits associated with clean energy policies and programs

Health Benefits per kilowatt hour (BPK)
Provides screening-level regional values to help estimate the health benefits associated with clean energy policies and programs
Cassandra Kubes
Senior Policy Specialist
U.S. Environmental Protection Agency
State and Local Energy and Environment Program
kubes.cassandra@epa.gov

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